

## Commentaries

# BEQUEST: The Framework and Directory of Assessment Methods

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## Introduction

This paper documents the interim findings of the BEQUEST (Building Environmental Quality Evaluation for Sustainability) network and the project's investigation of sustainable urban development. The network has its origins in an international conference: 'The Environmental Impact of Buildings and Cities', held in Florence in 1995 (Brandon et al. 1997). More recently the network has been supported with funding from the Research Directorate of the EU Framework 4 Programme. The project sets out to develop a common language and approach to Sustainable Urban Development (SUD) and aims to produce a framework, directory of assessment methods and set of procurement protocols for such purposes. The said framework, directory of assessment methods and procurement protocols, are currently in the process of being linked together in the form of a tool-kit. It is anticipated this instrument will be of particular use for those advising on the sustainability of urban development, taking decisions about the city of tomorrow and its cultural heritage. Collectively these deliverables are aimed at building environmental capacity, qualifying and evaluating the sustainability of urban development.

Reporting on the BEQUEST project and its methodology, the paper outlines the interim findings of work carried out on two of the project objectives: the framework for a common understanding of sustainable development (its foregrounding of the urban question) and the movement towards a directory of methods able to assess the sustainability of urban development in particular.

## 1 The BEQUEST Project and Methodology

Although BEQUEST is a Framework 4 project, it addresses Action 4 of the EU Environment and Climate Programme appearing in Framework 5. The aims and objectives of the BEQUEST project relate to Section 4.1 of the said Action (City of Tomorrow and Cultural Heritage). The project is also relevant to Section 4.3 and the paragraphs referring to

sustainable development, resource conservation and environmental protection. In terms of the EU's document: 'Sustainable Urban Development: A Framework for Action' (CEU 1998), the project also raises awareness of SUD. This is done by exploring ways of utilising communication and information technology to exchange experiences in framing the relevant issues and assessing the effect resource conservation and environmental protection has upon the city of tomorrow and its cultural heritage.

The 1992 E.C. Programme of policy and action, clearly identifies the need to study sustainable development as a priority, particularly in terms of reconciling the conflicting demands of urban growth, with those of resource conservation and environmental protection. The BEQUEST concerted action project aims to lay the foundations for a common understanding of sustainable urban development through a multi-disciplinary network of contributions from the scientific and professional communities. The research method adopted by the Concerted Action Programme, provides a structured process of interaction between the wide range of interests involved in the process of urban development (i.e. the planning, provision, use and maintenance of the built environment as a form of human settlement). Mature deliberation, debate and evolution are key elements of the project and develop through an iterative learning cycle of workshops, reflection and action.

The project partners, known as the Intranet, act as the mentors and facilitators of this process. Extranet members participate in the project through the workshops and by means of follow-up comments on information papers. Using communication systems, including a web page, the workshops provide the project partners and extranet members with the information technology needed for the networked community to debate sustainable urban development and enter into a dialogue about both resource conservation and environmental protection. Together the intranet and extranet represent the virtual organisation responsible for building the environmental capacity needed to qualify whether the city of tomorrow is able to carry its cultural heritage and evaluate if the forms of human settlement resulting from this process of urban development are sustainable. There are 14 partners in the BEQUEST EU project and over 130 extranet members in the networked community. To date 6 international workshops have been held (Milton Keynes, Amsterdam, Turin, Helsinki,

Florence, Vienna) and further details of this work, together with the associated information papers, can be found at the following web-site address: <http://www.surveying.salford.ac.uk/bq/extra>. The web-site also provides an outline of the project, the partners and extranet members.

## 2 A Framework for a Common Understanding

As any standard textbook on environmental issues points out, what sustainable development means is difficult to define. The first commonly accepted meaning of the term was that offered by the Brundtland Report, which defines it as: "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: 43). Subsequently the U.N. 'Earth Summit' held in Rio in 1992 developed a wider concept known as Agenda 21 and represented in shorthand form as Fig. 1 (Mitchell et. al. 1995, as developed by Cooper 1997). This focuses on a four-sided definition of sustainable development. Here attention is drawn to the concern about the quality of the environment, the equity of resource consumption, as well as the participation of the public in decisions taken about the future of the urban development process, the city of tomorrow and its cultural heritage.

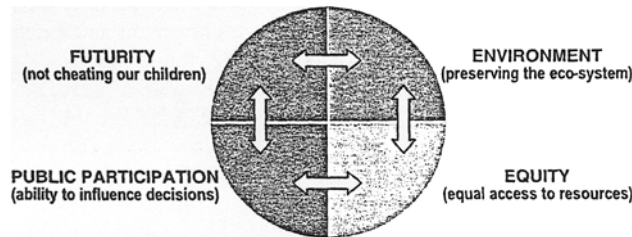


Fig. 1: The underlying issues of sustainable development (Source: Adapted from Cooper 1997)

It is this four-fold (environment, equity, participation and futurity) representation of sustainable development that the BEQUEST project has adopted. Following the issue of 'human settlement' appearing in the Brundtland Report, Agenda 21 and the UN Habitat Conference in 1996, the project has sought to draw upon these definitions as a means of moving the EU towards a framework for a common understanding of sustainable development. In Europe, human settlement is pre-dominantly urban in form (two thirds of EU citizens live in towns or cities) and as a consequence, questions about sustainable development relate to matters concerning the future of the urban development process. In particular they are matters that relate to questions about urban development, the city of tomorrow and its cultural heritage. They are questions about how to build the capacity needed to not only conserve resources and protect the environment, but qualify and evaluate whether such action is equitable and dealt with in a manner which fosters public participation in decisions taken over the future of urban development.

## 3 Fore-grounding the Urban Question

Drawing upon recent research findings, the project has sought to identify the common issues underlying this grow-

ing interest in sustainable development and structure them in such a way as to provide a framework for analysis (Nijkamp 1991, Mitchell et al. 1995, Mega 1996, Miltin and Satterthwaite 1996, Pugh 1996). This has been done by first adopting the Mitchell et. al (1995) definition of sustainable development, 'mapping out' the 'fuzzy buzzwords' (Palmer et al. 1997) and by then modifying it to include the issues underlying the process of urbanisation. The sustainable development issues underlying the urban process, are those drawn attention to by the EC and other organisations listed above. This modification has required the following:

- fore-grounding the question of urban development (Nijkamp 1991) and representing the process of urbanisation as a life cycle of inter-related activities;
- agreeing the sustainable development issues (Mega 1996, Miltin and Satterthwaite 1996) underlying the urban process;
- identifying the environmental, economic and social structure, spatial level and time scales of sustainable urban development (Pugh 1996).

In fore-grounding the urban question the project has sub-divided the development process by division of labour in the scientific and professional communities. The division of labour is question is that of urban development: planning, design, construction and operation (use, demolition and recycling). Representing the process of urbanisation as a life cycle of inter-related activities, the sustainable development issues that surface concern the environmental, economic and social structure, spatial level and time scales of SUD. The spatial level of analysis identifies the impact urban development has upon the built environment. This illustrates that the environmental impact can be at the city, district, neighbourhood, estate, building and component and material level. The consideration of time-scales also shows that the said impact can be short, medium and long-term in nature.

## 4 Towards a Directory of Environmental Assessment Methods

While the aforesaid provides a framework for analysis, it does not address the question of how decision makers can reverse the current trend of resource depletion, conserve resources and protect the environment? That is build – through resource conservation measures – the environmental capacity needed to ensure the city of tomorrow is able to carry its cultural heritage and develop forms of human settlement which are sustainable. To achieve this it is necessary to: (a) assess whether the environmental capacity (ecological integrity, equity, participation and futurity) required for the city of tomorrow to carry its cultural heritage currently exists and; (b) qualify and evaluate if the forms of human settlement which develop are sustainable. This raises the question of what assessment methods are currently available for such purposes and how they can, either on their own, or in combination with others, be drawn upon to build environmental capacity. That is build the environmental capacity needed for the city of tomorrow to not only carry its cultural heritage, but both qualify and evaluate if the forms of human settlement which develop from the process of urban development are sustainable?

In addressing this question, the networked community has agreed the sustainable development issues underlying the process of urbanisation. These have been defined in terms of their environmental, economic, social and institutional components. Here environmental issues take on the form of considerations about how the process of urbanisation consumes natural resources, whether it produces emission that pollute the atmosphere and the effect development has upon the bio-diversity of habitats. Economic considerations relate to questions about the financing of the infrastructures, transport and utilities required for the built environment to accommodate urban growth and the employment of resources associated with this development process. The social issues concern matters about access to such services, the safety and security of cities, human health and well-being cultural heritage provides (Fig. 2). The institutional issues refer to the governance, justice and ethics of settlement patterns subject to urban development.

The reason why sustainable development issues, their spatial levels and time scales raise questions about environmental assessment is of particular significance. This is because many of the assessment methods currently in existence are pre-Brundtland and in their present form do not adequately address the questions of, resource conservation, environmental capacity, or sustainable development. Many of the assessment methods currently in existence can be traced back to cost benefit analysis and the critique of the discounting principle this technique of analysis is based upon (Pearce and Markauya

1989, Pearce and Turner 1990, Norgaard and Howarth 1991, Rydin 1992, Deakin 1996, 97, 99). Their development can also be linked to the emergence of hedonic and non-market techniques of analysis as alternative forms of assessment. Techniques of analysis such as the contingent value and travel cost methods of environmental assessment (Miltin and Satterhwaite 1996, Brooks et al. 1997, Powell et al. 1997).

Since the Brundtland Report, the science of environmental assessment has been placed under investigation by the green movement and critical distinctions have been drawn between eco and anthropocentric techniques of analysis (Rees 1992, Pearce and Warford 1993). The former incorporating the ecological systems making up the environment which the anthropology of human settlement (in all its economic, social and institutional forms) is understood to depend. This is because since the Rio Earth Summit, attention has turned to the concept of 'ecological footprint' (Kozlowski and Hill 1993) and the anthropology of human settlements (Brehney 1992a, 1992b, Brehney and Rookwood 1993, Brehney, et al. 1993, Brehney 1995, Selman 1996). This in turn has led to the development of environmental assessment methods that assess whether the environmental capacity (ecological-integrity, equity, participation and futurity) required for the city of tomorrow to carry its cultural heritage currently exists. Methods that also in turn provide the means to both qualify and evaluate if the forms of human settlement which develop are sustainable (Brandon et al. 1997).

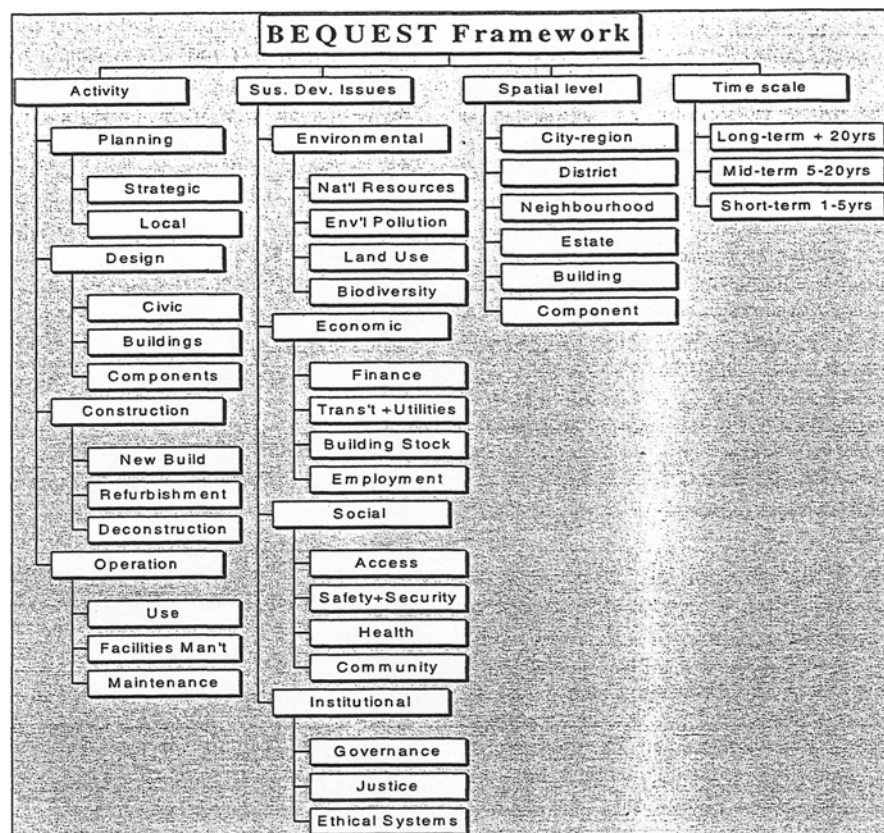


Fig. 2: The BEQUEST framework

Recent surveys of environmental assessment examine how the methods are currently being used. The examinations in question provide:

- reviews of how assessment methods are being drawn upon to promote sustainable development through resource conservation and environmental protection policies (Thrivel 1992, Glasson et al. 1994, Jowsey and Kellnet 1996, Lichfield 1996);
- evaluations of the impact that major infrastructure and building installation projects have upon resource conservation, environmental protection and the sustainable development of cities (Guy and Marvin 1997, Marvin and Guy 1997, Brandon et al. 1997);
- meta-analysis' of the potential that assessment methods have to conserve resources, build environmental capacity, support the city of tomorrow and its cultural heritage in forms of human settlement which are sustainable (Bergh et al. 1997, Nijkamp and Pepping 1998).

Such surveys illustrate the gaps that currently exist between the inter-related activities of the urban life cycle the assessment methods cover and the sustainable development issues which the techniques of analysis address (Cooper 1997). An example of this can be found in the different techniques used in the Environmental Impact Assessment (EIA) of larger urban development projects (i.e. infrastructure projects) and those drawn upon to assess individual building installations (Cooper and Curwell 1998). The surveys also reveal that scientific opinion about the potential of environmental assessment is currently divided. Firstly, there are those who are of the opinion environmental assessment methods can be used to promote sustainable development (Brandon et al. 1997, Bergh 1997, Nijkamp and Pepping 1998). Secondly, there are others who are of the opinion the all-pervasive marketisation, privatisation of the environment, resultant risk and uncertainty surrounding the nature of common goods, means the assessment methods currently available (for example, cost benefit analysis, the hedonic and non-market techniques of analysis) are no longer appropriate. As a consequence, this group tend to question whether the techniques of analysis currently available are appropriate for an assessment of SUD (Guy and Marvin 1997). This division of opinion is important for two reasons. Firstly, because it illustrates the scientific community is divided about both the quality and value of assessment methods. Secondly, the division of opinion tends to undermine the certainty the professional community needs to be confident not only about the quality and value of such assessments, but their overall worth as techniques of analysis (Pugh 1996, Cooper 1997, 99).

The position BEQUEST has taken on the matter tends to align with the first opinion. This is because the networked community is of the opinion environmental assessment methods can be used to promote sustainable urban development and that the uncertainty and risk surrounding the process of privatisation represents a particular, but not insurmountable challenge for the scientific community. The networked community is of the opinion that the source of such division lies in the absence of appropriate frameworks and the less than systematic approach which has previously been taken towards the inter-related activities of the urban life cycle,

sustainable development issues, spatial levels and time scales BEQUEST draw attention to (Curwell et al. 1998, Cooper and Curwell 1998). The assessment methodology the networked community adopts is based upon an understanding that the growing international and increasingly global nature of the relationship between the environment and economy is uncertain, resulting in as yet incalculable degrees of risk associated with EC Environment and Climate policy and any actions taken by member states about resource conservation. This in turn means that standard methods are of limited help in building environmental capacity because such exercises increasingly require the use of non-standard assessment (hedonic and contingency type) methods (Powell, Pearce and Craighill 1997).

Perhaps most critically though, the networked community is of the opinion that the point of departure for any such assessment is a critique of natural capital as an index of sustainable development and the formulation of what is termed a 'co-evolutionary approach' to assessment (Facheaux et al. 1996, O'Conner 1998, Facheaux and O'Conner 1998). This is because such an approach proposes that the environmental, economic and social are complementary. Not just in the way conservation can reduce resource depletion and build the environmental capacity needed for the city of tomorrow to carry its cultural heritage, but develop forms of human settlement which are sustainable. Which are sustainable in terms of the quality of life they offer.

It should perhaps also be noted that this concern with the quality of life is significant because it shifts attention to the environment in terms of ecosystem integrity (carrying capacity, degradation, waste, pollution etc.) and the scientific basis of such evaluations. What such studies do is turn attention towards the ecology of energy consumption and the laws of thermo-dynamics. The advantage of this lies in the opportunity such a form of assessment offers to apply the so-called 'hard' certainties of bio-physical science to the more uncertain, risky social relations connected with sustainable development (Facheaux and O'Conner 1998). This is done by emphasising the bio-physical and social in a co-evolutionary approach to the hard and soft issues of sustainable urban development (Fusco et al. 1997, Capello et al. 1999).

## 5 The Post-Brundtland Directory

In response to this, the partners of BEQUEST have sought to survey the methods currently in existence and provide the networked community with a post-Brundtland directory of environmental assessment. The methods surveyed are classified in terms of the following:

- name
- description
- data required
- status (well established, or experimental)
- activity (planning, design, construction and operation)
- environmental and social issues (environmental, economic, social and institutional)
- scale of assessment (spatial level and time scale)
- references

So far, the survey has identified that 59 such methods are available to conserve resources and build environmental capacity. It has also identified the said methods have been applied to the planning, design, construction and operational activities of the urban life cycle and used to analyse the sustainability issues this raises at the various scales of assessment.

The directory can be accessed via the web-site address referred to earlier in the paper. The web-site provides a copy of each standard classification and in a number of cases offers hyper-text links to the case-studies they have been drawn from. This provides the opportunity for the reader to explore the implications of applying the method in further detail and satisfying themselves as to whether the technique is appropriate for the assessment under consideration. The list of methods are drawn from a survey of the scientific literature and unpublished reports written by professional members of the community. In certain cases they represent assessment methods the partner and extranet members of BEQUEST have been engaged in developing or have a detailed knowledge of. A full list of the environmental assessment methods can be found in **Appendix 1: List of Environmental Assessment Methods**.

## 6 The Assessment Methods

The assessment methods fall into two classes: 'environment in general' and those augmenting into particular forms of 'life cycle assessments'. The environment in general tend to focus on assessments of eco-system integrity. Those augmenting into particular forms of life cycle assessment, tend to focus on building the environmental capacity needed to

not only qualify the integrity of eco-systems, but evaluate the equity, participation and futurity of the economic, social and institutional issues underlying the city of tomorrow and its cultural heritage. That is qualify and evaluate if the forms of human settlements which develop are sustainable.

Examples of the 'environment in general' class include: cost-benefit analysis, hedonic analysis and multi-criteria analysis. The forms of life cycle assessment have been sub-classified as 'environmental appraisal' (simple base-line qualifications) and 'environmental impact assessments' (complex and advanced evaluations). The forms of environmental appraisal include: the production of a compatibility matrix, the use of eco-profiling measures and environmental auditing techniques (simple-base line appraisals). The environmental impact assessments include: project, strategic, economic, social and community evaluations BEES, BREEAM, Eco-points and the Green Building Challenge (complex). It also includes, the MASTER Framework, the Pentagon model, the Quantifiable City model, SPARTACUS, the Sustainable City model, sustainable region, sustainable community and Transit-orientated settlement models, as advanced forms of environmental assessment. Examples of these two classifications are set out in **Table 1**.

In terms of the general and particular classification, the assessment methods tend to further sub-divide into the following types:

- methods supporting the post-Brundtland commitment to sustainable development in terms of the policies adopted by the EU and its member states (Bentivenga 1997, Davoudi 1997, Therivel 1998);

**Table 1:** Environmental assessment methods (Source: See Appendix 1)

Environment in General	Forms of Life Cycle Assessment	
	Environmental Appraisal	EIA
Contingent Valuation	Compatibility matrix	Project
Cost benefit analysis	Eco-profiling	Strategic
Hedonic analysis	Ecological footprint	• economic
Multi-criteria analysis	Environmental auditing	• social
Travel cost theory	Flag method	Community evaluation
	Spider analysis	ASSIPAC
		BEES
		BREEAM
		Eco-points
		Green Building Challenge
		MASTER Framework
		Meta-analysis (Pentagon method)
		NAR model
		Quantitative City model
		Regime analysis
		SPARTACUS
		Sustainable City model
		Sustain. communities
		Sustainable regions
		Transit-oriented settlement

- those centring on the assessments of projects providing the infrastructures (energy, water and drainage, transport, tele-communication technologies, leisure and tourism) required to build the environmental capacity (ecological integrity, equity, participation and futurity) needed for the city of tomorrow to carry its cultural heritage (Banister and Burton 1993, Nijkamp and Pepping 1994, Graham and Marvin 1996, William et al. 1996, Nijkamp et al. 1997, Guy and Marvin 1997a, b, Jones et al. 1996, Allwinkle and Speed 1997);
- those assessment methods focussing on the procurement and installation of operations, qualification and evaluation of whether the forms of human settlement which it builds are sustainable (Prior 1993, Vale and Vale 1993, Cole 1997, Curwell et al. 1999, Deakin 1999).

## 7 Building Environmental Capacity

The survey of the assessment methods currently being used to conserve resources and build environmental capacity, is drawn from those assessment methods listed in Appendix 1. It represents the classification of each method by inter-related activities of the urban life cycle, sustainable development issues, spatial level and time scale. The urban life cycle, sustainable development issues, spatial level and time scale to which both classes of assessment methods (environment in general and forms of life cycle assessment) are applied with the object of building environmental capacity.

Fig. 3 maps the methods by the inter-related activities (planning, design, construction and operation) of the urban life cycle, sustainable development issues, spatial level and time scale of assessment. It illustrates the strength of representation spread across the range of activities making up the aforesaid. In this aggregated form, the survey provides evidence to suggest a wide range of methods exist to assess the environmental capacity of all the activities (planning, design, construction and operational activities) making up the urban life cycle, sustainable development issues, spatial level and time scales. The purpose of mapping the assessment methods by such co-ordinates is fourfold. First, it illustrates the range and spread of methods currently available. Secondly, it provides the means to identify how the assessment methods are being used. Thirdly, it identifies the strength of representation by sustainable development issue, spatial level and time scale. Fourthly, it draws attention to the gaps that exist in the range and spread of methods needed to provide a comprehensive assessment of environmental capacity. It also provides the opportunity to direct further research aimed at developing the methodology (science, theory and practice) of environmental assessment.

What the mapping exercise suggests is that the scientific and professional communities are drawing on assessment methods to build environmental capacity. It provides evidence to suggest that assessment methods are being used to build environmental capacity (ecological integrity, equity, participation and futurity) in the policy planning, infrastructure

		Planning	Design	Construct	Operation
Sustainable Development Issues	Environmental				
	Economic				
	Social				
	Institutional				
Spatial Level	City-region				
	District				
	Neighbourhood				
	Estate				
	Building				
	Component				
Time Scales	Long				
	Medium				
	Short				
Policy					
Infrastructure					
Procurement					
Installation					

Fig. 3: Assessment methods (Source: Mapping of Appendix 1)

Note: the shading is indicative of the 'intensity scores', or 'frequency' by which the assessment methods address the sustainable urban development issues in question.

design, construction procurement and operation of installations. It also illustrates that it is the urban life cycle, sustainable development issues, spatial levels and time scales of the planning policy and infrastructure design activities, which are the most strongly represented forms of assessment. This is because the other forms of assessment (construction and operation) are not as well covered in terms of sustainable development issues, spatial level, or time scale (see Fig. 3). This suggests that the gaps which exist in the range and spread of methods needed to provide a comprehensive assessment are located here in the construction and operation stages of the urban life cycle, their particular sustainable development issues, spatial levels and time scales.

It should be noted that Fig. 3 does not map how the assessment methods represent the ecological integrity, equity, participation and futurity issues underlying the sustainability issues of the urban development process. To be explicit about this further analysis will need to be carried out. These will need to extend the analysis beyond the matrix-based mapping set out in Fig. 3 and introduce a more comprehensive grid referencing system. One that can map, not only the urban development process in terms of its life cycle, sustainability, spatial levels and temporal scale, but cross-reference them with the ecological integrity, equity, participation and futurity components of the assessment methods in a form of 'frontier analysis'.

What follows will limit its observations to the mapping exercise of Fig. 3 and discuss what it tells us about the attempts being made to build environmental capacity. In particular, it is proposed that Fig. 3 provides evidence to suggest:

1. A number of methods exist to assess the post-Brundtland commitment towards sustainable development and these include the use of:

- Cost benefit analysis, contingent valuation, travel cost, hedonic and multi-criteria analysis, to assess the environmental value of urban development proposals;
- simple base-line methods drawn upon to assess the integrity of eco-systems and ensure the economic, social and institutional issues underlying the process of urbanisation are consistent with policy commitments towards sustainable development.

Examples of such methods appear under the title of 'environmental appraisal' and include: the use of compatibility, eco-profiling and ecological foot-printing exercises. They also include the use of environmental auditing techniques, the flag method and a spider analysis exercise.

- the use of more complex methods to assess whether infrastructure projects (servicing energy, water and drainage, transport, tele-communication technologies, leisure and tourism services), build the environmental capacity (in this instance ecological integrity) that is needed for the city of tomorrow to carry its cultural heritage in forms of human settlement which are economically efficient in the way they accommodate growth, encourage competitiveness and the social cohesion of institutions.

Examples of such methods appear under the heading of EIA and include project, strategic, economic, social and community evaluations.

- the development of complex methods that assess the environmental capacity of building installations, qualify and evaluate whether the forms of human settlement which they provide are sustainable.

These evaluations include BREEAM, Eco-points, the Green Building Challenge, the NAR (net annual return) model of environmental impact assessment.

- the emergence of advanced methods which assess (at the level of policy and infrastructure projects) the ecological integrity and equity of the alternative urban development paths it is possible for the public to participate in. Participate in, that is, as those pathways most able to build the environmental capacity, economic and social structures needed for the city of tomorrow to carry its cultural heritage. Participate in and select, it ought to be added, as those forms of human settlement whose future is seen to be sustainable due to the quality of life which such evaluations institute.

These methods include ASSIPAC, the MASTER Framework, the Pentagon model, the Quantitative City model, SPARTACUS, the Sustainable City, sustainable region, sustainable community and Transit-orientated settlement models.

2. The methods are used in a specific or more general capacity. That is as a means to assess the environmental capacity of a specific stage of the urban development process i.e. policy planning, or in the more general capacity. In, for example, the more general capacity of qualifying and evaluating whether the planning and design of the city of tomorrow, its cultural heritage and forms of human settlement are sustainable (Birtles 1997, Cooper 1997, 99).

3. The use of the methods illustrates the growing interdisciplinary nature of the assessment exercise, providing evidence of assessment methods being used to assess the following:

- the policy planning and infrastructure design of the urban development process;
- the infrastructure design, procurement of construction and operation of installations making up the city of tomorrow and its cultural heritage.

Irrespective of whether the methods in question are applied to policy planning, infrastructure design, procurement of construction, or the installation of operations, the object of the 'environment in general class' is to assess the environmental capacity (in this instance ecological integrity) of the sustainable development issues under consideration. With the application of this class, it is also noticeable that any economic analysis is confined to the planning and design stage of policy and infrastructure provision and does not extend into the construction procurement, or installation of operations. This is also the case for any social issues that surface from the application of such assessment methods. Perhaps most noticeable is the relative absence of any institutional analysis at this level of assessment. With the 'forms of life cycle assessment' the situation is somewhat different. This is because with this class of method there is evidence to suggest the assessments take environmental capacity to



include the equity, public participation and futurity of the sustainable development issues underlying the economic and social structures in question. The economic and social structures that underlie the city of tomorrow and which support its cultural heritage. The economic and social structures that not only underlie the city of tomorrow and support its cultural heritage, but give rise to forms of human settlement which it is the object of the assessment methods to both qualify and evaluate the sustainability of.

It is also noticeable that in augmenting into this kind of life cycle assessment, it is common to see methods from the other classification (environment in general) embedded in and providing the foundation for the range of environmental appraisals and impact assessments undertaken. This is common irrespective of whatever environmental appraisal is undertaken and whether the environmental impact assessment is of the simple, complex, or even advanced type. Examples of this occur with the use of cost benefit analysis in environmental appraisal and impact assessment (Glasson et al. 1994, Lichfield 1996, Therival 1998). It is also evident in the use of the multiple-regression component of the hedonic technique. The technique forming the meta-analysis of policy planning and infrastructure design (Berg et al. 1997, Nijkamp 1998). Another example of this can also be found in the transformation of multi-criteria assessments into regime analysis and use of this technique to resolve environmental conflicts over the economic and social structure of sustainable development (Bizarro and Nijkamp 1997). Although, even here, there is clear evidence to show the methods experience noticeable difficulties in dealing with the complexity of institutional structures and the range of stakeholder interests this introduces into any such assessment (Lombardi 2001).

4. The methods are being applied at different spatial levels of analysis and evidence exists to suggest these are as follows:
  - methods to assess the policy and planning of sustainable development are applied at the city-regional, district and neighbourhood scale;
  - these levels of analysis are also typical of the methods adopted to assess the policy planning and design of major infrastructure projects;
  - in terms of methods assessing the design, construction procurement and operation of the various building installations, the levels of analysis tend to be those of the estate, building, component and material levels.
5. The time-scales implied in the assessment of policy commitment and both planning and design of major infrastructure projects at the city-regional, district and neighbourhood scale, is medium to long term. However, often the political pressures for rapid reversal of areas in environmental stress, economic decline and social deprivation, means that the opposite is the case. So, as with the design, construction and operation of the various building installations, short-term considerations often apply and can be seen to dominate the concerns of the assessment in question (Curwell and Lombardi 1999).

6. The simple base-line, complex infrastructure and installation methods tend to restrict the spatial level of assessment to the city-region, district, neighbourhood, estate, building and component level of analysis, while the advanced methods assess the cumulative national, growing international and global impact of the urban development process over the long, medium and short term. In taking this form, the advanced assessment methods recognise the need for a pan-European understanding of the urban development process. This in turn recognises the need to develop assessment methods that are urban in nature. That is urban in the sense they provide the technologies and communicative structures required by member states to conserve resources and build the environmental capacity needed for the city of tomorrow to carry its cultural heritage. Furthermore, do so in a form of human settlement that is sustainable in terms of the quality of life which evaluations of this kind (i.e. of a macro, meso and microscopic nature) institute (Brandon and Lombardi 2001).
7. While this suggests a great deal of headway has been made post-Brundtland to progress the theory, science and practice of assessment, it should be recognised that it is only the simple base-line methods for policy planning, infrastructure design, construction procurement and installation of operations, which are currently well established. This is because the more advanced assessment methods are still experimental.
8. It should also be recognised the following tend to restrict the degree of progress made in advancing the theory and practice of assessment:
  - the tendency for the policy planning and infrastructure design stages to overshadow the assessment needs of the construction procurement and operation of installations (Cooper 1997, 1999, 2000, Deakin 2000, 01);
  - the paucity of environmental, economic and social (sustainable development) indicators it is possible to draw upon as a means of benchmarking and assessing the effect policy, infrastructure, procurement and installation have upon the capacity which the city of tomorrow has to carry its cultural heritage (Mitchell 1996, 2000);
  - the fact that this in turn makes it difficult – in methodological terms – to assess the aggregate effect policy planning, infrastructure design, construction procurement and operation of installations, have upon attempts to not only build environmental capacity, but develop the economic and social structures needed to qualify and evaluate whether such action leads to a position where the city of tomorrow is able to carry its cultural heritage. If, in particular, the form of human settlement that develops for such purposes is sustainable in terms of the quality of life which such evaluations institute (Brandon and Lombardi 2000, Cooper 2000, Lombardi 2000).

The aforesaid are restrictive because they tend to highlight the rather limited nature of the data-sets currently available to assess the impact of the urban development process and inform us about the effect attempts to build



environmental capacity (in this instance, the ecological integrity, equity, public participation and futurity of its economic and social structures), have upon the city of tomorrow, its cultural heritage and forms of human settlement.

## 8 Conclusions

This paper has outlined the areas of the Environment and Climate Programme (Economic and Social Aspects of Human Settlement) the BEQUEST project addresses. It has also examined the framework for analysis the project sets out for a common understanding of SUD and the assessment methods currently made use of by planners, architects, engineers and surveyors to build environmental capacity. The paper has done this by:

- foregrounding the question of urban development and representing the process of urbanisation as a life cycle of inter-related activities;
- agreeing the sustainable development issues underlying the urban process;
- identifying the environmental, economic and social structure, spatial level and time scales of sustainable urban development.

Having done this, the paper has gone on to set out the issues the BEQUEST project addresses in moving towards a directory of assessment methods. This in turn has led to an outline presentation of the post-Brundtland directory of assessment methods the networked community has compiled to date. The paper has suggested the assessment methods in question fall into two classes: 'environmental in general' and those augmenting into particular forms of 'life cycle assessments'. It has proposed the environment in general tend to focus on assessments of eco-system integrity. It has also proposed that those methods augmenting into particular forms of life cycle assessment, tend to focus on the environmental capacity needed to not only ensure the integrity of eco-systems, but the equity, participation and futurity (sustainable development) of the economic, social and institutional structures underlying the city of tomorrow and its cultural heritage. It has also suggested that such assessment methods are used to evaluate whether the forms of human settlement which surface from this process of urban development are sustainable in terms of the quality of life they institute. The paper has also begun to highlight some of the current problems associated with the application of the said methods and weaknesses they illustrate in assessing the sustainability of urban development. These include:

- the need to extend the analysis beyond the matrix-based mapping set out in this paper and to introduce a more comprehensive grid referencing system. One that can map, not only the urban development process in terms of its life cycle, sustainability, spatial levels and temporal scale, but cross-reference them with the ecological integrity, equity, participation and futurity components of the assessment in a form of 'frontier analysis';
- the difficulty current assessment methods have in dealing with the complexity of institutional structures and associated stakeholder interests;
- the tendency for the policy planning and infrastructure design stages to overshadow the assessment needs of the

other stages and result in a situation where comparatively speaking, relatively little is known about either the procurement of construction, or installation of operations;

- the paucity of sustainable development indicators currently available in relation to a broader context of environmental, economic and social issues;
- the problem of assessing the aggregate effect policy, infrastructure, procurement and installations in question have upon attempts to not only build environmental capacity (ecological integrity, equity, public participation and futurity), but use the economic and social structures this institutes to qualify and evaluate the sustainability of urban development.

Finally, it is recognised that methods able to overcome such difficulties are still in the research phase and that practical tools for an integrated assessment of SUD are some years away. In the meantime, the decision support toolkit being developed by BEQUEST will provide some assistance to professional actors carrying out such assessments. It will identify appropriate and relevant methods and allow them to be used for the purposes of establishing whether the city of tomorrow, its cultural heritage and forms of human settlement are sustainable.

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#### Appendix 1

##### List of Assessment Methods (19 September 2000)

Analysis of Interconnected Decision Areas (AIDA)	Flag Model
Analytic Hierarchy Process (AHP)	Green Building Challenge
ASSIPAC ( Assessing the Sustainability of Societal Initiatives and Proposed Agendas for Change)	Hedonic analysis
ATHENA	Green Guide to Specification (An Environmental Profiling System for Building Materials and Components)
BEPAC	Hochbaukonstruktionen nach ökologischen Gesichtspunkten (SIA D0123)
BRE Environmental Assessment Method (BREEAM)	INSURED
BRE Environmental Management Toolkits	Leadership in Energy and Environmental Design Green Building Rating System (LEEDTM)
Building Energy Environment (BEE 1.0 )	Life Cycle Analysis (LCA)
Building Environmental Assessment and Rating System (BEARS)	Mass Intensity Per Service Unit (MIPS)
Building for Economic and Environmental Sustainability (BEES 2:0)	MASTER Framework
Cluster Evaluation	Meta Regression Analysis
Community Impact Evaluation	Multi-Criteria Analysis
Concordance Analysis	Net Annual Return Model
Contingent Valuation Method	Optimierung der Gesamtanforderungen (Kosten/Energie/Umwelt) ein Instrument für die Integrale Planung (OGIP)
Cost Benefit Analysis	PAPOOSE
Eco-Effect	PIMWAQ
Eco-Indicator '95	Project Impact Assessment
Eco-Instal	Regime Analysis
Economic Impact Assessment	Quantitative City Model
Ecological Footprint	Planning Balance Sheet Analysis
Eco-points	Risk Assessment Method(s)
Ecopro	SANDAT
Eco-Profile	Semantic Differential
EcoProP	Social Impact Assessment
Eco-Quantum	SPARTACUS
ENVEST	Strategic Environmental Assessment (SEA)
Environmental Impact Analysis	SUDECIR
Environmental Impact Assessment	SYSTEM
Environmental Profiles (The BRE Methodology for Environmental Profiles of Construction Materials, Components and Building Materials)	Sustainable Communities
EQUER	Sustainable Cities
ESCALE	Sustainable Regions
Financial Evaluation of Sustainable Communities	Transit-orientated Settlement